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A Case of Severe Acute Respiratory Syndrome (SARS) Coronavirus 2 in Pregnancy: A Multidisciplinary Approach

Kalpana Tyagaraj*#, Ravi Grandhi, Joseph Kim, Stanislav Belotserkovskiy, Christina Dgheim, Dennis Feierman

Department of Anesthesiology, Maimonides Medical Center, Brooklyn, NY, USA
Email: *kalpana_tyagaraj@msn.com

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Abstract

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) is a truly novel, multifaceted disease that has negatively impacted the lives of many including the pregnant women. We present a 34-year-old pregnant patient at 35 weeks with SARS-COV-2 requiring emergent cesarean section under general endotracheal anesthesia and a prolonged postoperative course in the ICU with multiple end organ function derangement of this disease. After nearly 1 month, she was discharged home. Her baby did not have any manifestations of SARS-COV-2 and was able to go home after 5 days.

Keywords

SARS-COV-2 Infection, Pregnancy, Severe Acute Respiratory Syndrome, Multisystem Organ Failure

1. Introduction

From the limited data available, pregnancy and childbirth do not increase the risk for acquiring Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection and do not worsen the clinical course compared with non-pregnant individuals of the same age. Most importantly the majority of infected mothers recover without undergoing delivery. Parturients with associated co-morbidities like diabetes, lung disease, or heart disease, have a higher risk of becoming sicker from COVID-19. Currently, there is no evidence to suggest that pregnant women without underlying health conditions are more likely to have serious complications, need to be hospitalized, or need ICU care if they are in-

#First author.

fected with the virus [1] [2]. Whether the normal immunologic changes of pregnancy have any influence on the occurrence and course of the disease is unknown. Some parturients with SARS-CoV-2 show laboratory evidence of an exaggerated inflammatory response (similar to cytokine release syndrome), which has been associated with critical and fatal illnesses. We report a case of a pregnant female with SARS-CoV-2 disease, who needed prolonged intubation, emergent delivery of the fetus, and prolonged ICU care.

2. Case Report

A 34 years old, pregnant female at 35+ weeks of gestational age, Gravida 4 and para 2 (one still birth) was admitted to labor and delivery (L&D) with history of fever of 48 hours duration and dry cough. Patent stated that she felt extremely tired and weak since the previous day. She denied any chest discomfort or shortness of breath or headache or any difficulties with passing urine. Her maximum temperature prior to arrival was 101.3˚F. Patient denied any recent travel or significant sick contacts. She had received the influenza vaccine earlier in the pregnancy, at 27 weeks of gestational age. Her pregnancy had been complicated by gestation diabetes mellitus type (GDMA2). She was treated with insulin and metformin. She also received subcutaneous heparin 5000 units twice a day for thromboprophylaxis.

On initial presentation to L&D, she had grossly normal vital signs other than a heart rate in the 130 s - 140 s. On tocodynamometer, fetal heart rate was category 1 with irregular contractions. Due to the current outbreak, the patient had a nasopharyngeal swab for Flu and Respiratory Syncytial virus (RSV) which was also negative. She also had a COVID19 swab, which was still pending. X-Ray of the chest revealed possible bilateral infiltrates and CT Chest revealed multiple bilateral nodular and irregular shaped consolidative and ground glass opacities both in the upper and lower lung fields, many with a relatively peripheral distribution, highly suggestive of COVID-19 viral pneumonia. Laboratory tests were obtained including an arterial blood gas (ABG), erythrocyte sedimentation rate (ESR), lactic acid dehydrogenase (LDH), and C-reactive protein (CRP). Based on the constellation of symptoms, a decision was made to admit this patient for presumed SARS-COV-2. About 48 hours after admission to L&D, patient continued to improve on antibiotics-azithromycin, amoxicillin, and ceftriaxone and decided to leave against medical advice (AMA) and she was advised to continue the current antibiotic regimen for seven more days. On follow up via telephone the next day, the patient reported feeling well, denied fever, chills, nausea, vomiting, shortness of breath, cough or any other symptoms.

Two days after the patient signing out AMA, she was called to come for fetal assessment and Biophysical profile (BPP). When she presented to triage, she continued to deny symptoms including CP, SOB, HA, N/V, chills, fevers. She was tolerating PO nutrition and ambulating without difficulty. She was compliant with antibiotics azithromycin, amoxicillin, and ceftriaxone that were prescribed to her upon discharge. However, patient continued to be tachycardic to 130's

with a fetal tachycardia at 165 beats per minute (bpm). Later that evening, she spiked a fever of 101˚F and started to have shortness of breath on ambulation. ID was re-consulted now that patient has worsening fever and shortness of breath. At that time, supportive care was continued with supplemental oxygen via nasal cannula. The COVID PCR was still pending. After completing a 5-day course of ceftriaxone and azithromycin between her two admissions, the patient was discharged home. At time of discharge she was afebrile and not requiring any supplemental oxygen.

One day later, patient returned with an elevated temperature, dry cough, severe shortness of breath and decreased fetal movement. On arrival patient was saturating 89% on room air, with a respiratory rate of 25. Decision was made by the obstetric care team to proceed with urgent Cesarean section because of maternal distress and non-reassuring status of the fetus. Decision was made to proceed with general anesthesia with endotracheal intubation and the patient was transferred to SICU, intubated, for further management. General anesthesia was chosen because the patient was tachypneic and not oxygenating appropriately on room air.

3. Intraoperative Course

Anesthesia care team was ready in the operating room after donning Personal protective equipment (PPE). After receiving oral non-particulate antacid 30 ml, patient was brought into the operating room and standard ASA monitors were placed. Left uterine displacement was ascertained. Preoxygenation was done with 100% oxygen. After the patient was prepped and draped and the OB care providers were ready to make the incision, rapid, sequence induction with cricoid pressure was done with Propofol 200 mg iv, 2% Lidocaine 100 mg iv, and succinylcholine 120 mg. Intubation was done by trained providers under video laryngoscopy with 7.0 cuffed endotracheal tube. Once the cuff was inflated and etCO2 was confirmed, incision was made by the surgical team and baby was delivered 3 minutes later with APGARS of 7&9. Anesthesia was maintained with oxygen, sevoflurane 0.5 MAC, and fentanyl. Patient remained hemodynamically stable and SpO2 remained at 95% - 96% with a FiO_2 of 1. Patient was transferred to surgical intensive care unit (SICU), intubated. The C-Section was uneventful and lasted under two hours. Intraoperatively, patient received 1500 ml of lactated ringer's and estimated blood loss was 900 ml.

4. Postoperative Course

After the patient was transferred to SICU, she was placed on contact, droplet and airborne isolation and a left radial arterial line was placed for frequent blood draws to monitor arterial blood gases. She was ventilated according to ARDS.net protocol, on volume control with a tidal volume of 500, PEEP of 8, FiO_2 0.5. Goals for ventilatory management were to adjust FiO_2 and PEEP to correct hypoxemia and maintain PaO_2 greater than 60 mmHg and maintain airway pressures less than 30 cm water for lung protection. She was started on hydroxych-

loroquine 400 mg q12h x2, then 200 mg q12h for 4 days and azithromycin 500 mg x1, followed by 250 mg daily for 4 days. Also, because of prolonged hospitalization, Vancomycin and cefepime was started to cover hospital community acquired pneumonia. Tracheal cultures, MRSA culture and serial blood cultures were sent for analysis. She was sedated with fentanyl at 1.5 mcg/kg/hr and propofol 40 mcg/kg/min to maintain a RAAS of −4. She was started on lactated ringers at 125 ml/hr and tube feeds via nasogastric tube. Further, she was maintained on deep vein thrombosis prophylaxis with sequential compression devices and enoxaparin. Electrolytes were titrated to maintain a magnesium of around 2 and potassium of 4. She had stable renal function and making appropriate amounts of urine. On the following day, patient developed hypotension responsive to fluids and phenylephrine.

On day 4, patient was requiring increasing pressor requirements with phenylephrine up to 1.0 mcg/kg/minute, unchanged chest X-ray with unchanged extensive bilateral patchy infiltrates, and increased ventilatory settings with volume control ventilation of a tidal 500, PEEP 18, FiO_2 0.90. She continued to make appropriate volume of urine. On day 6, patient was weaned off of rocuronium, which she had been on since intubation. She was also started on tocilizumab 400 mg iv. On day 9, patient spiked another fever when she was being weaned down on the FiO_2. Vancomycin was discontinued and she was started on cefepime and metronidazole for a potential superimposed bacterial co-infection. She also began to require more PEEP, as high as 24 cm of H_2O (**Figure 1**). Chest X-ray findings were stable. She was started on diuretic therapy, multivitamins, Vitamin C and zinc therapy. On Day 13, she continued to spike fevers, however, the pulmonary edema began to improve. On day 16, the propofol was weaned off and dexmedetomidine infusion was started. PEEP was also weaned down to 5 and P/F ratios began to improve. On Day 19, patient self-extubated and tolerated face mask. The foley was discontinued and patient was started on physical therapy. Her nasogastric tube was removed and she was started on puree diet. She was downgraded from the ICU on day 24 and discharged 2 days later. On her follow up visit, she continued to do well and didn't have any respiratory symptoms and the baby was doing well too.

5. Discussion

Limited information is available regarding the effect of COVID-19 on obstetric or neonatal outcomes. Initial reports of COVID-19 disease acquired in the third trimester were largely reassuring, but most data are limited to case reports and case series. In one of the larger series from Wuhan, China, pregnant women did not appear to be at risk for more severe disease [1]. 7 Among 147 pregnant women with COVID-19 (64 confirmed cases, 82 suspected cases, and 1 case of asymptomatic infection), 8% had severe disease and 1% had critical disease. In comparison, in the general population with COVID-19, 13.8% had severe disease and 6.1% had critical disease. While the data are still emerging, the US experience has been similar to date. Management of the infected, pregnant patients

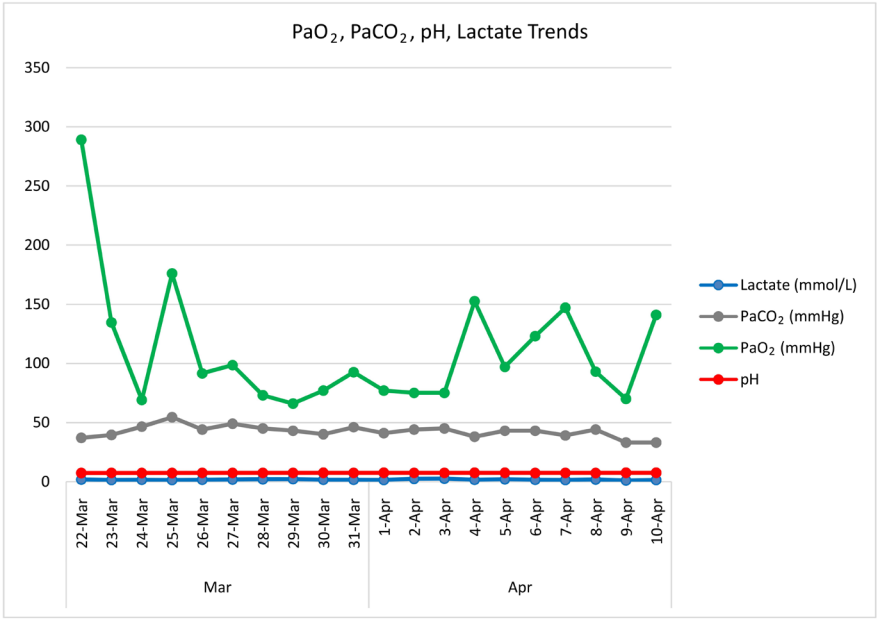

Figure 1. ICU STAY: PaO_2, $PaCO_2$, pH and Lactate trends.

depends on the severity of the infection and the associated co-morbidities. Most pregnant patients with known or suspected COVID-19 have mild disease (no shortness of breath) that does not require hospitalization and it is prudent to ensure no obstetric problems (e.g., preterm labor) coexist [3]. Counseling the patient regarding how to care for herself at home is similar to that in nonpregnant persons.

Though most pregnant patients manifest with a milder form of the disease and do not require either hospitalization or ICU admission, our patient with the associated comorbidities of pregestational diabetes and obesity did show severe respiratory insufficiency requiring prolonged hospitalization and ICU admission.

Experience with management of this pregnant patient with severe SARS-CoV-2 respiratory disease happened in the earlier period of COVID-19 crisis which triggered the immediate need for protocol driven approaches from multidisciplinary teams caring for these sick patients. The expedited development of management goals from multispecialty teams not only streamlined the care of these patients but also heightened the awareness regarding the wide range of clinical presentations of COVID-19 disease in pregnant patients.

Obstetric goals of management of a pregnant patient with COVID-19:

Pregnant women with mild disease plus comorbidities or moderate to critical disease are hospitalized [2]. The principles of management of COVID-19 in the pregnant patient should include:

- Optimal timing of prenatal care visits
- Screening tests in uninfected women and in infected women
- Management of potential pregnancy related complications
- Timing and management of labor and delivery and postpartum care (moth-

er-newborn separation, breastfeeding, infant care, postpartum depression risk)

- Fetal and uterine contraction monitoring

Monitoring pregnant patients for signs and symptoms of preterm labor is a routine component of obstetric care and should be a component of maternal monitoring of pregnant patients hospitalized in nonobstetric settings.

Preterm labor: Fever and hypoxemia from severe pneumonia may increase the risks for preterm labor, premature rupture of membranes, and abnormal fetal heart rate patterns. Preterm deliveries also occurred in patients without severe respiratory disease. It appears that many of the initial third-trimester cases were electively delivered by cesarean because of a bias to intervene catalyzed by the belief that management of severe maternal respiratory disease would be improved by delivery; however, this hypothesis is unproven.

- Individualized delivery planning
- A team-based approach with multispecialty consultation inclusive of Maternal fetal Medicine specialist (MFM), obstetric anesthesiologist, intensivist and the neonatologist.

Maternal oxygenation level—Among critically ill COVID-19 patients, profound acute hypoxemic respiratory failure from acute respiratory distress syndrome (ARDS) is the dominant finding. General supportive care of the critically ill patient with COVID-19 pneumonia is similar to that in patients with ARDS due to other causes. Common complications of COVID-19-related ARDS include acute kidney injury, elevated liver enzymes, and cardiac injury (e.g., cardiomyopathy, pericarditis, pericardial effusion, arrhythmia, sudden cardiac death). During pregnancy, maternal peripheral oxygen saturation (SpO_2) should be maintained at ≥95 percent, which is in excess of the oxygen delivery needs of the mother. If SpO_2 falls below 95 percent, an arterial blood gas is obtained to measure the partial pressure of oxygen (PaO_2): Maternal

PaO_2 greater than 70 mmHg is desirable to maintain a favorable oxygen diffusion gradient from the maternal to the fetal side of the placenta. In the intensive care unit (ICU), severely ill patients with COVID-19 are often managed in the prone position. Some ICUs have extended this approach to pregnant women, although even a semi-prone position can be a difficult position in which to place a pregnant woman in the last half of pregnancy.

Obstetric Anesthesiologist's role and Anesthesia goal specific considerations:

Obstetric anesthesiologists are the critical care component of busy Labor and Delivery unit. Apart from providing effective labor analgesia and providing anesthesia for operative delivery, obstetric anesthesia team can assist with optimizing oxygenation for the pregnant COVID-19 patient (nasal cannula vs non-rebreathing mask versus High-flow oxygen therapy), provide emergency intubation with appropriate safety measures (PPE, PAPRs, rapid sequence technique, use of video laryngoscope), assist with vascular access and management of he-

modynamics. The following general recommendations follow the APSF (Anesthesia Patient Safety Foundation) guidelines for management of women who tested positive for COVID19 or who are persons under investigation (PUI) [4] [5] [6]:

1) Admit to isolation room, preferably a negative pressure room, and limit the number of care providers to the strict minimum.

2) Patients and support people should wear a face mask at all times.

3) All healthcare workers should implement droplet and contact precautions with eye protection upon entering delivery room (gown, gloves, surgical mask, face shield).

4) Donning and doffing takes time. Avoid emergency situations by anticipating needs.

- Early epidural analgesia may reduce the need for general anesthesia for emergent cesarean delivery. A COVID-19 diagnosis itself is not considered a contraindication for neuraxial anesthesia.
- Avoid emergent cesarean deliveries as much a possible-proactive communication with obstetrical and nursing teams. For respiratory distress intubate early using appropriate PPE.
- Assign the most experienced anesthesia provider whenever possible for procedures (neuraxial, intubation).
- Consider minimizing use of trainees in direct care of COVID-19 patients. Minimize the number of personnel in the room.

5) Prior to entering the operating room, regardless of the type of anesthesia [4] [7];

- Anesthesia providers and necessary assistants should implement droplet and contact precautions with eye protection. Risk of an aerosol-generating medical procedure should be evaluated for consideration of airborne PPE precautions (gown, gloves, and N95 with face shield or powered air-purifying respirator (PAPR)).
- Use donning and doffing check lists and trained observers. Double glove for ALL procedures and replace the outer layer of gloves after intubation.

6) If GA indicated—All personnel in the OR at the time of intubation should wear airborne PPE precautions. Minimize to only essential personnel during intubation—use your best judgement, while making sure you have some assistance readily available

- Pre-oxygenation should occur with a circuit extension and HEPA filter at the patient side of the circuit.
- Use a closed suction system (if available).
- Intubation should occur via a means to maximize success on first attempt and minimize any need to provide bag-mask ventilation (video-laryngoscope).
- Extubation is equally, if not more of a significant risk; minimize personnel, utilize airborne (N95/PAPR) precautions. If proceeding with extubation at the end of case, extubate in the OR, maintain airborne precautions until the patient is ready for transfer. Consider the possible risks and benefits of trans-

porting intubated patients to a negative pressure room (e.g. ICU) for emergence/extubation.

7) In accordance with the rational use guidance issued by the WHO, hospitals are recommending airborne PPE precautions only for special procedures, e.g. aerosol generating medical procedures such as intubations/extubations. Institutions may have different institutional guidelines, which should be followed for don/doff.

8) Since the care of a COVID19 patient, including the time for donning and doffing, is time intensive, additional staffing may be needed, and back-up strategies may need to be developed.

9) Some experts have suggested avoiding the use of NSAIDs for symptoms suggestive of COVID infection, however this is controversial and robust data is lacking. It is unknown if the treatment of postpartum pain with NSAIDs will worsen the trajectory of COVID+ patients. NSAIDs can likely continue to be used safely in asymptomatic patients.

10) Antiemetics should be administered to prevent vomiting in patients undergoing cesarean delivery. However, due to potential risks of steroids in the setting of COVID infection, consider avoiding the use of dexamethasone for PONV prophylaxis in PUI/COVID+ patients.

Fetal/Neonatal considerations

Much is still unknown about the risks of COVID-19 to the pregnancy and to the baby.

- Mother-to-child transmission of COVID-19 during pregnancy is unlikely [8]. However, after birth, a newborn can be infected after being in close contact with an infected person, including the baby's mother or other caregivers.
- A small number of babies have tested positive for the virus shortly after birth, according to limited published reports. However, it is unknown if these babies got the virus before, during, or after birth.
- A small number of other problems, such as preterm birth, have been reported in babies born to mothers who tested positive for COVID-19 late in their pregnancy. However, we do not know if these problems were related to the virus [9].

6. Conclusions

- Based on what we know about COVID-19, we believe pregnant people appear to have the same risk of COVID-19 as adults who are not pregnant. However, much remains unknown [10]. We do know that pregnant people have had a higher risk of severe illness when infected with viruses that are similar to COVID-19, as well as other viral respiratory infections, such as influenza.
- We also know that parturients have physiologic changes that may increase their risk of some infections and the clinical manifestations. Therefore, parturients should always try to protect themselves from illnesses whenever possible.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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